

3-D Modeling

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Motivation

- What are some uses of 3-D modeling?

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- What are some uses of 3-D modeling?
- Gaming
- Movies
- Training
- Design



Clockwise from top left: Gran Turismo 5 (ign.com), Toy Story (pixarblog.blogspot.com), Volve, Solidworks. This is the only slide with pictures!

Outline

- Modeling
- Texturing
- Animation

- The art side versus the programming side

Modeling

- Many different programs are used to create models. Some examples:
 - Autodesk products (3Ds MAX, Maya)
 - Blender
 - Google Sketchup
- I will demonstrate with Blender...

Modeling

- What information defines a model?
- Let's take a look at a .obj model file...

Modeling

```
o Cube
v 1.000000 -1.000000 -1.000000
v 1.000000 -1.000000 1.000000
v -1.000000 -1.000000 1.000000
v -1.000000 -1.000000 -1.000000
...
f 1 2 3
f 1 3 4
f 5 8 7
f 5 7 6
...
```

Texturing

- We have a model now... but it looks kind of flat.
- We want to give our model some color.
- This is usually accomplished through **texturing**.

Texturing

- Texturing is like designing a papercraft.
- I have a papercraft example—pass it around!

Texturing

- First, you “unwrap” your model by cutting some edges and flattening the pieces out.
- Next, you arrange your pieces on your texture.
- Finally, you draw on the texture to color the model.
- Another Blender demonstration...

Texturing

- How does a computer keep track of how you textured the model?
- First, it has the image file corresponding to what you drew for the texture.
- Second, it matches every vertex of every face to a point on the texture. (The renderer can fill in the colors in-between the vertices.)
- This is actually a little more flexible than physical paper.
- Let’s take another look at the .obj format...

Texturing

```
o Cube
v 1.000000 -1.000000 -1.000000
v 1.000000 -1.000000 1.000000
...
vt 0.675000 0.065000
vt 0.675000 0.325000
vt 0.415000 0.325000
vt 0.415000 0.065000
...
f 1/1 2/2 3/3
f 1/1 3/3 4/4
f 5/5 8/6 7/7
f 5/5 7/7 6/8
...
```

Animation

- Now we have a (hopefully) nice-looking model!
- But it just sits there...
- Animation to the rescue!

Animation

- One of the most common ways of animating a model is **keyframing**.
- You specify how the model is posed at some points in time, and the computer figures out the rest.
- Yet another Blender demonstration...

Conclusion

- These are all just some of the parts of **computer graphics**.
- Other work that falls under computer graphics include physics-based animation, ray tracing, sound rendering, and many more.